**ST JOSEPH’S COLLEGE (AUTONOMOUS), BENGALURU -27**

**M.Sc. BIOTECHNOLOGY – III SEMESTER**

**SEMESTER EXAMINATION: OCTOBER 2022**

**(Examination conducted in December 2022)**

**BT9222 – IMMUNOLOGY AND MEDICAL BIOTECHNOLOGY**

**Time: 2.5 Hours Max Marks: 70**

**This paper contains TWO printed pages and THREE parts**

**PART A**

**Answer any TEN questions: 2m x 10 = 20 marks**

1. State two functions of GM-CSFs.
2. What is the importance of germinal centers in secondary lymphoid organs?
3. Briefly state the importance of positive selection in T cells.
4. State the function of opsonins.
5. Why are dendritic cells called professional antigen presenters?
6. State two class I cytokine receptors along with their functions.
7. What are xenografts?
8. Illustrate the thymus-dependent and thymus-independent modes of B cell activation.
9. What is the role of AID in a) humoral and b) cell mediated immunity.
10. Germ free mice lack a fully functional immune response. Justify.
11. Draw the detailed structure of IgM.
12. Describe how you would generate a T cell that is constitutively activated.

**PART B**

**Answer any FIVE questions: 6 x 5 = 30 marks**

1. Explain the stages of acute inflammation.
2. Why is the central tolerance leaky?
3. Explain the mechanism of graft vs host disease.
4. Describe the various modes by which diversity in the TCR is generated. While generating this diversity, a T cell introduced a stop codon in CDR3. What will be its fate?
5. What are third generation CAR-T cells and how are they superior to previous generations? Design a prototype CAR-macrophage against the SARS CoV2 spike protein.
6. Illustrate the endogenous pathway of antigen presentation. Viruses generally evade detection by downregulating MHCI molecules. What weapons can the host use in this scenario?
7. Gullu has generated a vaccine for *Mycobacterium tuberculosis* that is specifically targeted to B cells and not T cells. Describe the immune response to the vaccination. What will be your approach for developing version 2.0 of the vaccine?

**PART C**

**Answer the following questions: 10m x 2 = 20 marks**

1. A. Explain any TWO mechanisms by which cytokines mediate their action.

**OR**

B. Explain the mechanism and treatment of the following autoimmune disorders:

1. Myasthenia Gravis

2 Systemic Lupus Erythematosus

3. Multiple sclerosis

4. Rheumatoid arthritis

5. Graves’ disease

1. A. Describe the formation of the immunological synapse. How does this lower the killing of healthy bystander cells? A strain of mouse overexpresses adhesion molecules in T-Cells and B-cells. How will this impact humoral and cell mediated immunity? (6+4)

**OR**

B. A B-cell sitting in the lymph node has undergone affinity maturation and help from T cells. Suddenly, the lymph node was flooded with IL4 which aids in switching to IgE. Illustrate the process in detail. How will all the processes mentioned above be impacted if the mouse is injected with a proteasome inhibitor? (7+3)